Title

The Fourth-Century AD Expansion of the Graeco-Roman Settlement of Karanis (Kom Aushim) in the Northern Fayum*

Journal

The Journal of Egyptian Archaeology, 101(1)

ISSN

0307-5133

Authors

Barnard, Hans
Wendrich, Willeke Z
Nigra, Ben T
et al.

Publication Date

2015

DOI

10.1177/030751331510100103

Peer reviewed

THE JOURNAL OF
Egyptian Archaeology

VOLUME 101

2015

PUBLISHED BY
THE EGYPT EXPLORATION SOCIETY
3 DOUGHTY MEWS, LONDON WC1N 2PG

THE FOURTH-CENTURY AD EXPANSION OF THE GRAECO-ROMAN SETTLEMENT OF KARANIS (KOM AUSHIM) IN THE NORTHERN FAYUM*

By HANS BARNARD, WILLEKE Z. WENDRICH, BEN T. NIGRA, BETHANY L. SIMPSON, *and* RENÉ T. J. CAPPERS

The Graeco-Roman town of Karanis, founded during the Ptolemaic Period in the north-eastern Fayum in the third century BC and long thought to have been abandoned in the third century AD actually saw a substantial expansion during the fourth century AD. With the creation of an 3extension towards the west and the expansion of the eastern part, the town grew in both directions. We argue that this expansion may be related to a sudden rise of the water level in Lake Moeris (Lake Qarun), perhaps linked to a catastrophic dam breach in the eastern part of the Fayum, and the subsequent relocation of the inhabitants of the low-lying settlements north and east of the lake.

هانز برنارد، و ڤيليكا ز. ڤيندريش، وبيثانى ل. سمبسون

توسع مدينة كرانيس (كوم أوشيم) الواقعة شمال الفيوم، وتعود للعصر اليوانانى الرومانى خلال القرن الرابع الميلادى

تأسست مدينة كرانيس اليونانية – الرومانية خلال العصر اليونانى فى القرن الثالث ق.م فى شمال شرق الفيوم. كان يعتقد لفنرة طويلة أنها هجرت فى القرن الثالث الميلادى، لكنها فى واقع الأمر شهدت توسعا كبيرا خلال القرن الرابع الميلادى باتجاه الغرب والشرق. ونعتقد أن هذا التوسع ربما يرتبط بارتفاع مفاجىء فى مستوى مياه بحيرة قارون (بحيرة موريس)، أثر تصدع كارثى لسد فى الجزء الشرقى للفيوم، و بالتالى نقل سكان مستوطنات المناطق المنخفضة شمال وشرق البحيرة.

History of the research

DURING the Neolithic, Middle Kingdom and Graeco-Roman periods, the Fayum region provided a significant part of Egypt's total agricultural yield and at present produces large volumes of wheat, olives, grapes and dates. In 2003, the URU Fayum Project, an international interdisciplinary research project by the University of California, Los Angeles (USA), the University of Groningen (the Netherlands) and the University of Auckland (New Zealand) was initiated to study the archaeology of the area north-east of Lake Qarun. As human activities are not confined to small, clearly defined sites—

* This research project is directed by Willeke Z. Wendrich (UCLA, USA), René T. J. Cappers (University of Groningen, the Netherlands) and Simon J. Holdaway (University of Auckland, New Zealand) and financed, in part, by UCLA, the University of Groningen, the University of Auckland, the Apache Corporation, the Marshall Fund, the Institute for Field Research, and several individual donors of which we especially would like to mention Deborah Arnold, Harris Bass, Jill Smethills and Tom Voytovich. More information is readily available through the project's website <http://www.archbase.org/fayum/>.

such as settlements, cemeteries or temples—but rather take place in the relatively empty landscape that surrounds and connects them, the project's objective is to study all archaeological remains in their larger geographical and temporal contexts. The aim of the research is primarily to provide a diachronic overview of changing climate, water management and land use in relation to agricultural activities and development in the region.[1] Archaeological remains in this area mostly bear witness to Epipalaeolithic, Neolithic and Graeco-Roman activities, and these periods thus form the temporal focus of our research. Fieldwork spatially centres on the prehistoric shore lines of Lake Qarun and three Graeco-Roman settlements: Qaret Rusas (ancient Neilopolis), al-Qarah al-Hamra and Kom Aushim (ancient Karanis).[2]

Qaret Rusas (at 29°N 31'39.7"–30°E 49'19.3" or UTM Zone 36R–288925 E–3268430 N; approximately –41 mASL), also known as Tell al-Rusas, sits on a low limestone peninsula in Lake Qarun, at present less than 3 m above the surface of the lake. In 2003, we discovered another Graeco-Roman site north of the lake about 3 km north-west of Qaret Rusas (fig. 1). This we named al-Qarah al-Hamra (Red Table-Hill) after the modern name for the area. The site (at 29°N 32'24.2"–30°E 47'40.6" or UTM Zone 36R–286295 E–3269850 N; approximately –39 mASL) rests on a sandy plain south of the prehistoric lake basins X and Z.[3] Expanding agricultural activity had partially destroyed the site, but a geophysical survey and excavations indicated that substantial ancient remains survived below the modern surface (fig. 2). Analysis of the ceramic surface finds indicated that both al-Qarah al-Hamra and Qaret Rusas were abandoned around the fourth century AD. The lake apparently covered both settlements some time after their abandonment. This is evident from partly dissolved mud-brick architecture, layers of mud covered by windblown sand, and a considerable number of pot sherds and stone blocks with a layer of calcium carbonate. The latter is formed and deposited by algae in shallow alkaline water. The date of this flooding event—or possibly flooding events—is not yet established. At present al-Qarah al-Hamra is a little over 2 km inland from the lake and about 5 m above its current surface (fig. 3). The ancient remains at Qaret Rusas, at a lower elevation, are now all but destroyed. The extensive canal system that allowed irrigation outside the immediate lake drainage during the Graeco-Roman Period must have also serviced these settlements.[4] Archaeological research is scheduled to address these issues in the near future. The likely catastrophic events that ended the occupation of Qaret Rusas and al-Qarah al-Hamra apparently had a significant impact

[1] S. J. Holdaway, W. Z. Wendrich and R. S. Phillipps, 'Identifying Low Level Food Producers: Detecting Mobility from Lithics, *Antiquity* 84 (2010), 185–94; W. Z. Wendrich, S. J. Holdaway, R. T. J. Cappers, and R. S. Phillipps, 'A Research Design to Investigate the Fayum Neolithic', in Y. Tristant and M. Ghilardi (eds), *Archéologie du paysage: l'Égypte et le monde méditerranéen* (Cairo, in press); and R. S. Phillipps, S. J. Holdaway, W. Z. Wendrich and R. T. J. Cappers, 'Mid-Holocene Occupation of Egypt and Global Climatic Change, *Quaternary International* 251 (2012), 64–76.

[2] R. T. J. Cappers, E. C. Cole, D. Jones, S. J. Holdaway and W. Z. Wendrich, 'The Fayum Desert as an Agricultural Landscape: Recent Research Results', in C. Arlt and A. Stadler (eds), *Das Fayyûm in Hellenismus und Kaiserzeit* (Wiesbaden, 2013), 35–61; and W. Z. Wendrich, J. E. M. F. Bos and K. M. Pansire., 'VR Modeling in Research, Instruction, Presentation and Cultural Heritage Management: The Case of Karanis (Egypt)', in M. Ioannides, D. Arnold, F. Niccolucci and K. Mania (eds), *The 7th International Symposium on Virtual Reality, Archaeology and Cultural Heritage* (Geneva, 2006), 226–30.

[3] G. Caton-Thompson and E. W. Gardner, *The Desert Fayum* (London, 1934).

[4] R. J. Cook, *Landscapes of Irrigation in the Ptolemaic and Roman Fayum: Interdisciplinary Archaeological Survey and Excavation near Kom Aushim (Ancient Karanis), Egypt* (PhD thesis, University of Michigan; Ann Arbor, 2011).

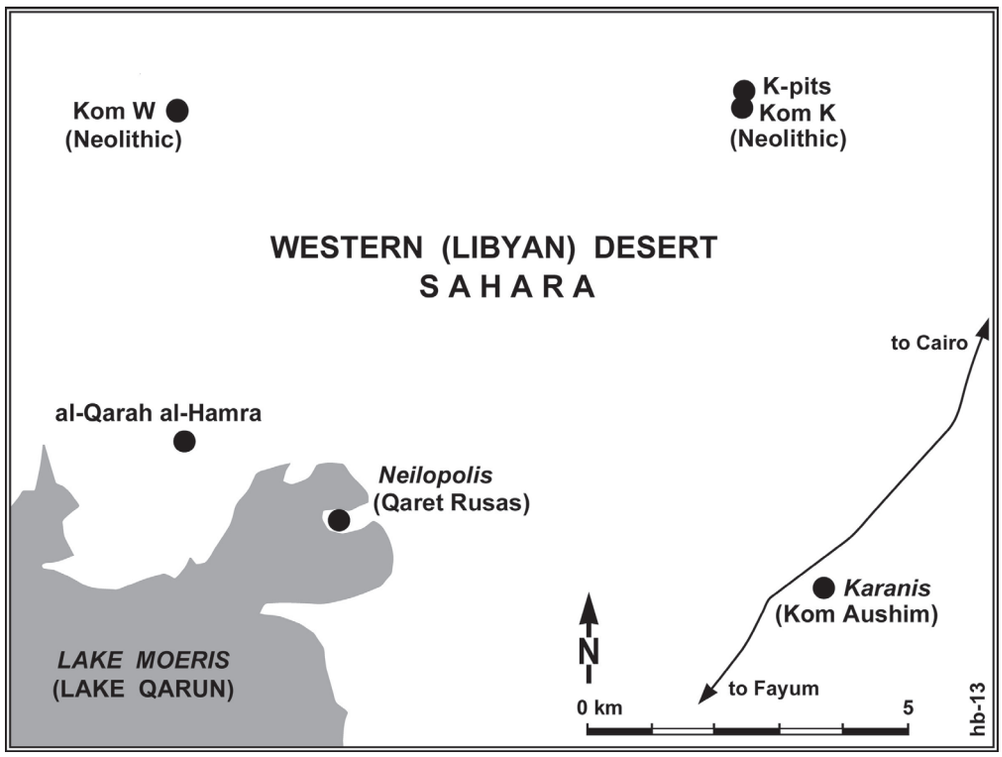

Fig. 1. Map of the north-eastern shore of Lake Qarun (Lake Moeris) at the edge of the Fayum Depression, showing the positions of al-Qarah al-Hamra, Qaret Rusas and Karanis (see also fig. 3).

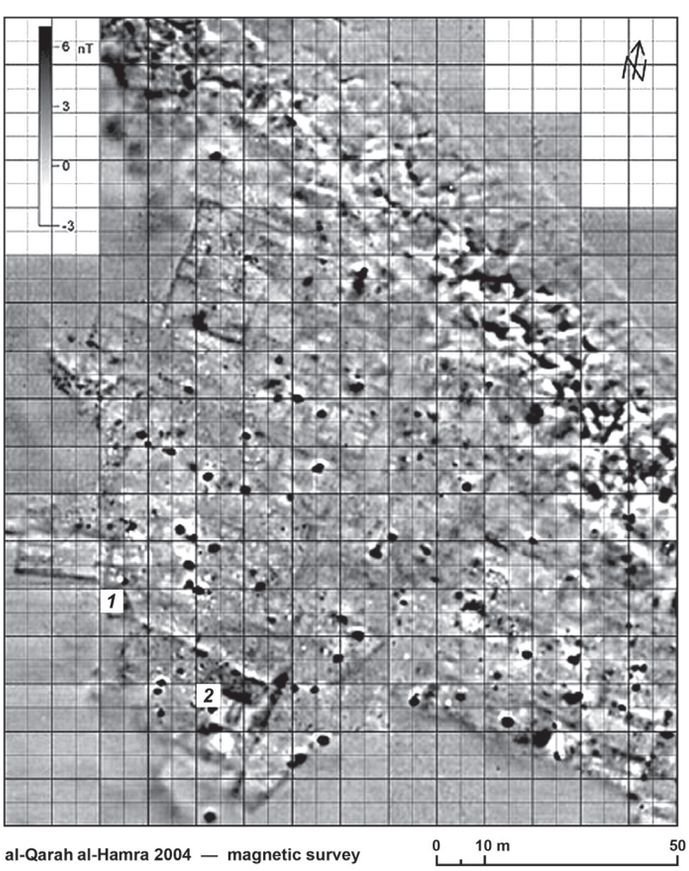

Fig. 2. Magnetometric map of al-Qarah al-Hamra, prepared in 2004 by Tomasz Herbich (IAE PAN) and Paweł Gan (Cardinal Stefan Wyszyński University) using a Geoscan Research FM36 fluxgate gradiometer. As shown by surface survey and targeted excavations (squares 1 and 2), many of the rectilinear features on this map represent ancient mud-brick architecture, large dark circles represent ancient kilns or ovens, and smaller dark circles represent metal objects. Towards the north-east the image is disturbed by clay deposits, which may represent an ancient shoreline. Beyond this the archaeological remains are destroyed by modern agriculture.

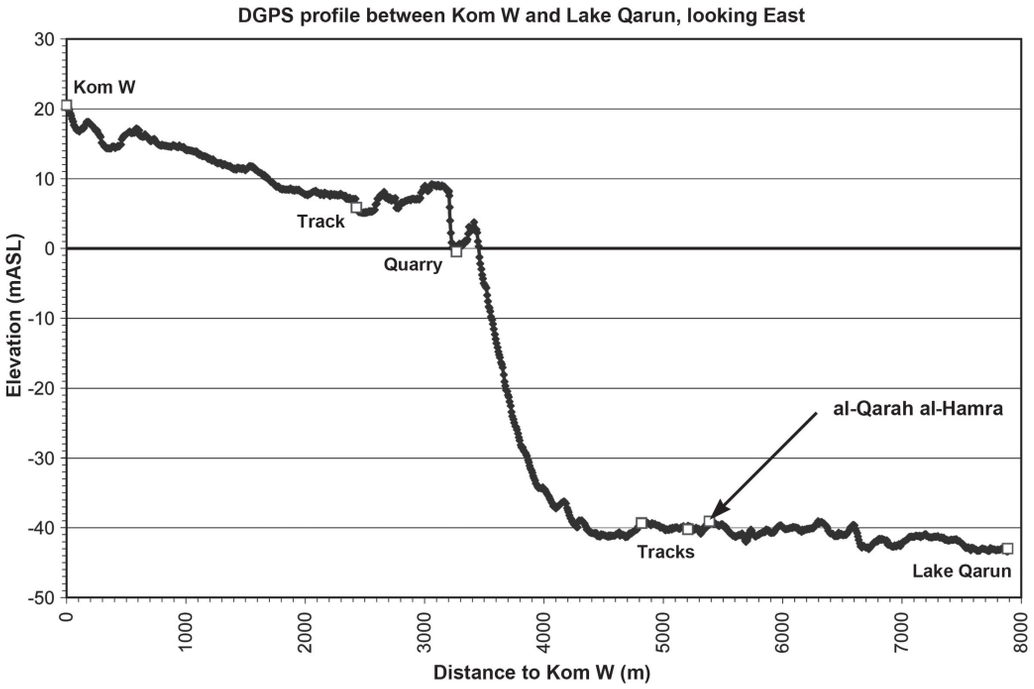

Fig. 3. Profile of the modern desert surface between the Neolithic site Kom W[5] and Lake Qarun, prepared by Hans Barnard and Willeke Wendrich in 2007 using a Trimble ProXRT DGPS receiver corrected in real-time by the Omnistar (Texas, USA) differential signal. The line of the profile passes several modern tracks and a modern quarry; al-Qarah al-Hamra is about 2500 m from the current shore and about 1500 m from the first steep escarpment between the Fayum depression and the high desert (see also fig. 1).

on the third large Graeco-Roman settlement in the region, Karanis (modern Kom Aushim). As the western villages were abandoned, many of the residents seem to have moved to Karanis, which saw a dramatic expansion in the fourth century AD.

The site of Kom Aushim was visited in 1890 by W. M. Flinders Petrie,[6] who commented on the looting that had taken place in the cemetery north of the site. Bernard Grenfell, David Hogarth and Arthur Hunt performed the first excavations in 1895 and 1900.[7] As they were mostly interested in unearthing papyri, their strategy was to follow layers that they considered promising in order to maximize their yield. From their finds, they identified the ancient remains at Kom Aushim as the Graeco-Roman town of Karanis. In their publication they mention the ongoing removal of mud brick and organic debris (*sebakh*) from the site to be used as fertilizer on nearby fields. At the suggestion of Francis Kelsey in 1924, the University of Michigan started large-scale stratigraphic excavations at Karanis in 1924. These were initially directed by James Starkey and from 1926 to 1934 led by Arthur Boak and Enoch Peterson.[8] When they started work in Karanis, the removal of *sebakh* was organized at an industrial

5 See Caton-Thompson and Gardner, *The Desert Fayum*.

6 W. M. F. Petrie, *Illahun, Kahun, and Gurob* (Warminster, 1891).

7 B. P. Grenfell, A. S. Hunt and D. G. Hogarth, *Fayûm Towns and Their Papyri* (London, 1900); and B. P. Grenfell and A. S. Hunt, 'Karanis Cemetery', *Egypt Exploration Fund Archaeological Reports 1900-1901* (London, 1901), 4.

8 A. E. R Boak and E. E. Peterson, *Karanis, Topographical and Architectural Report of the Excavations During the Seasons 1924-28* (Ann Arbor, 1931); and A. E. R. Boak, *Karanis, the Temples, Coin Hoards, Botanical and Zoological Reports Seasons 1924-31* (Ann Arbor, 1933).

scale by Daira Agnelli Gianotti, a company with a permit to remove 200 m^3/day by a light railway built for this purpose. The excavators eventually succeeded in halting this destruction of the ancient city, but on their maps they had to identify the central part of the site—between the two stone-built temples—as an 'area totally destroyed'. Most of the excavated material was divided between the Egyptian Museum in Cairo, the Agricultural Museum in Dokki (Giza, Egypt), the Graeco-Roman Museum in Alexandria, and the Kelsey Museum in Ann Arbor, Michigan, USA, where it remains to date.[9] As was customary at the time, large areas were excavated relatively quickly and left abandoned after excavations came to a halt, without any arrangements for their preservation. From 1972 to 1975 a project by Cairo University, in cooperation with the Institut Français d'Archéologie Orientale, excavated the north-western part of the town, first under the direction of A. A. Ali and subsequently under S. A. A. el-Nassery.[10] Their publication of the excavated architecture focuses mostly on a decorated bath house,[11] again leaving large parts of the city both unpublished and exposed to the elements. In 2005, the URU Fayum Project decided to reinvestigate the site. This included a detailed survey of the standing remains, limited excavations, and the partial restoration of the University of Michigan and Cairo University dig-house. This large building was constructed in phases on ancient foundations, partly out of ancient materials. Its design is an interesting illustration of vernacular Egyptian architecture with elements reminiscent of the Graeco-Roman Period architecture as found in the ancient site. With the support of the Apache Corporation, the United States Ambassador's Fund for Cultural Preservation and the Association for the Urban Development of Islamic Cairo it was made into a visitors' centre (Beyt Sobek) and expanded with a small open-air museum in which monumental stone objects from the Middle Kingdom temple of Sobek of Shedet (Arsinoe, modern Kiman Faris) are displayed. Research activities in Karanis are combined with an archaeological field school for both Egyptian antiquities inspectors and foreign undergraduate students,[12] supervised by professional archaeologists assisted by graduate students.

In her summary of the topography and architecture at Karanis, Elinor Husselman (1979) supports the assertion by Boak and Peterson (1931) that the original Ptolemaic settlement began nearest the canal in the south. She hypothesized that the settlement was later extended northward towards the North Temple, across the now destroyed

[9] D. B. Haden, *Roman Glass from Karanis Found by the University of Michigan Archaeological Expedition in Egypt, 1924-29* (Ann Arbor, 1936); H. C. Youtie and O.M. Pearl, *Papyri and Ostraca from Karanis (Michigan Papyri* VI*)* (Ann Arbor, 1944); H. C. Youtie and J. G. Winter (1951), *Papyri and Ostraka from Karanis, Second Series (Michigan Papyri* VIII*)* (Ann Arbor, 1951); R.A. Haatvedt and E. E. Peterson, *Coins from Karanis* (Ann Arbor, 1964); E. M. Husselman, *Papyri from Karanis (Michigan Papyri* IX*)* (Cleveland, 1971); L. Shier, *Terracotta Lamps from Karanis, Egypt* (Ann Arbor, 1978); E. M. Husselman, *Karanis: Excavations of the University of Michigan in Egypt, 1928-35: Topography and Architecture* (Ann Arbor, 1979); B. Johnson, *Pottery from Karanis: Excavations of the University of Michigan* (Ann Arbor, 1981); E. K. Gazda, *Karanis: An Egyptian Town in Roman Times: Discoveries of the University of Michigan Expedition to Egypt (1924-1935)* (Ann Arbor, 1985); and T. G. Wilfong and A. W. S. Ferrara (eds), *Karanis Revealed: Discovering the Past and Present of a Michigan Excavation in Egypt* (Ann Arbor, 2014).

[10] S. A. A. el-Nassery, 'A New Roman Hoard from Karanis', *BIFAO* 75 (1975), 183–202 ; and G. Wagner and S. A. A. el-Nassery, 'Une nouvelle dédicace au grand dieu Soxis', *ZPE* 19 (1975), 139–42.

[11] S. A. A. el-Nassery, G. Wagner and G. Castel, 'Un grand bain gréco-romain à Karanis', *BIFAO* 76 (1976), 231–75.

[12] W. Z. Wendrich, 'From Practical Knowledge to Empowered Communication: Field Schools of the Supreme Council of Antiquities', in R. Boytner, L. Schwarz-Dodd and B. J. Parker (eds), *Controlling the Past, Owning the Future: The Political Uses of Archaeology in the Middle East* (Tucson, 2010), 178–95.

central part of the town and probably centred around the South Temple. She also notes, probably incorrectly, that no east–west thoroughfares seem to have existed in Karanis, although at least two major north–south streets are preserved east and west of the central part of city.[13] The destruction of the site by *sebakheen*—those who collect *sebakh*—and the large-scale excavations of the University of Michigan and Cairo University, however, make it extremely difficult to infer the original layout and final urban fabric of Karanis. The entire centre of the site has been dug away by *sebakheen* down to bedrock and removed, while the buildings excavated between 1924 and 1934, as well as those excavated between 1972 and 1975, suffered considerable erosion, filling the areas in between with the resulting debris. Substantial mounds of back-dirt further obscure the view, effectively cutting Karanis West and Karanis East off from the original centre of the site (fig. 4). The two temples—the only buildings on site constructed entirely of stone blocks—now tower over the remains of the ancient town and are completely disconnected from their original context, as *sebakheen* and archaeological excavators removed adjacent buildings to bedrock or to much earlier and often discontinuous levels, respectively. The two parts of the town, north-east and south-west of the previously excavated and relatively well-documented city centre, seem to have escaped attention almost completely. Apart from some cursory remarks, they do not feature in the reports or plans of previous excavators. This is somewhat understandable for Karanis West, which comprises unimpressive visible remains, but rather surprising for Karanis East, which has substantially more visible remains.

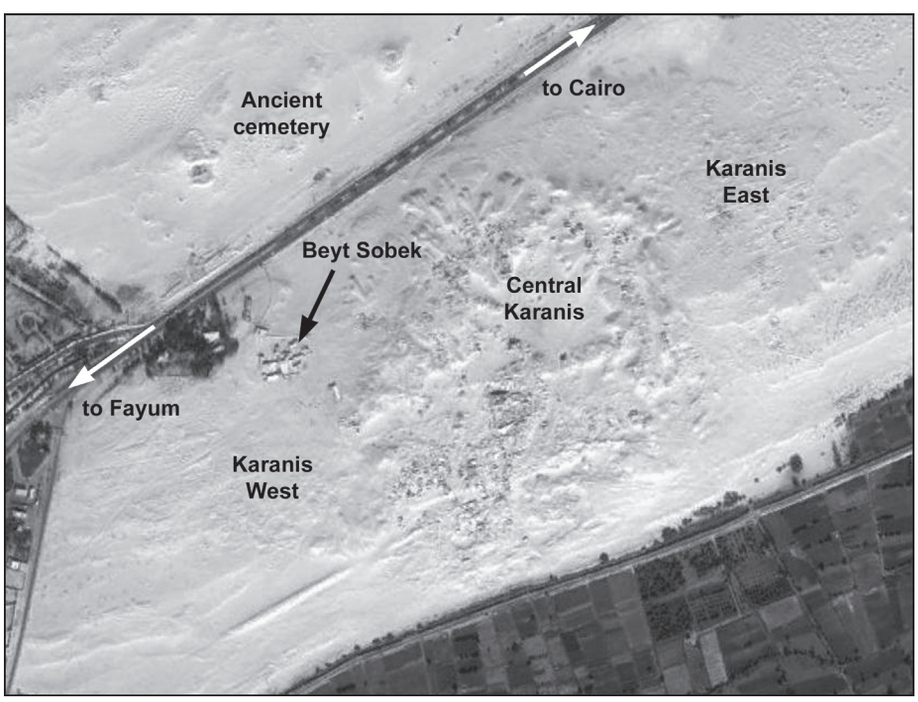

Fig. 4. Satellite photograph showing the remains of ancient Karanis (modern Kom Aushim). The highway between Cairo and Fayum, separating the town from its cemetery to the north, follows the same route as the first road constructed in 1927. The trees at the western edge mark the modern entrance to the site. Beyt Sobek, the former dig-house, is being restored into a visitors' centre. The modern canal between the southern edge of the site and the area of cultivation most likely follows the same route as the ancient canal that serviced the city[14] (satellite image courtesy of Google Earth).

[13] Husselman, *Topography and Architecture*, 12, 29; Boak, *Karanis* 1924-31.

[14] See Cook, *Landscapes of Irrigation*.

A vital component of the current research project at Karanis is the survey and recording of the site's visible remains. The expedition of the University of Michigan did engage in extensive mapping projects, including individual house plans and sections, but did not create a comprehensive plan of the site and seems to have ignored large parts outside its centre. The plans, created in the 1930s and mostly published in 1979, are furthermore intended to show the stratigraphic interpretation of the excavators, who published them in convenient sections, omitting empty areas between map sheets. Finally, the dramatic erosion of the site has changed the appearance of the city to such an extent that old plans no longer represent the reality on the ground. It is indeed very difficult at times to correlate them with what is visible in the terrain at present. We therefore decided that a fresh plan was urgently needed and performed a comprehensive survey of the site over several seasons from 2007–11 using a Topcon GTS-235W total station and a Trimble ProXRT DGPS receiver corrected in real-time by the Omnistar (Texas, USA) differential signal. All measurements were projected onto zone 36R (36N) of the WGS84 geode, all heights were calculated above mean sea level (table 1). The newly collected data was visualized using AutoCAD (Autodesk), Foresight DXM (TDS), and GPS Pathfinder Office (Trimble) software. The first observation evident when comparing new maps, drawings and photographs with those of the 1930s is the extent of the deterioration of the ancient structures (fig. 5).[15] In many places, mud-brick buildings that once stood more than two stories high after excavation are now reduced to their foundations—often made of stone rather than mud brick. This destruction is mostly due to wind and water erosion, accelerated by the decay or removal of wooden elements such as door or window frames and the levelling beams inside walls. Throughout the site, damage to the mud-brick architecture is substantial and even structures of fired brick or stone have dwindled, mostly due to the undercutting of walls or the removal of architectural elements.[16]

TABLE 1 *UTM-coordinates of the principle fixed points used for the survey of Karanis (Kom Aushim). Measurements were taken as close as possible to the lowest point where the exterior faces of two stone temple walls meet. Coordinates are projected within zone 36R (N) of the WGS84 geode, elevations are above mean sea level.*

	Eastings (m)	**Northings (m)**	**elevation (mASL)**
North Temple			
north-west corner	296754.25	3267412.22	5.93
north-east corner	296764.53	3267415.03	5.24
south-east corner	296769.18	3267397.31	5.05
south-west corner	296758.70	3267394.49	5.25
South Temple			
north-west corner	296748.93	3267208.98	2.23
north-east corner	296770.51	3267212.37	2.20
south-east corner	296772.86	3267196.96	2.19
south-west corner	296751.40	3267193.52	2.32

[15] T. G. Wilfong, 'The University of Michigan Excavation of Karanis (1924-1935): Images from the Kelsey Museum Photographic Archives', in C. Rigg (ed.), *The Oxford Handbook of Roman Egypt* (Oxford, 2012), 223–43.

[16] H. Barnard, W. Z. Wendrich, A. Winkels, J. E. M. F. Bos, B. L. Simpson, and R. T. J. Cappers, 'The Preservation of Exposed Mud-Brick Architecture in Karanis (Kom Aushim), Egypt', *Journal of Field Archaeology* 41(1) (2016), 84–100.

Fig. 5. Photographs comparing the appearance of Karanis after excavation in 1920s with today (1920s photographs by George R. Swain, courtesy of the Kelsey Museum of Archaeology; 2012 photographs by Sebastián Encina, Kelsey Museum of Archaeology). The picture at the top left shows the area south of the North Temple, the picture at the top right shows the area north of the South Temple. The pictures below show approximately the same view in 2012.

Karanis West

In the area south-west of the buildings excavated by the University of Michigan and Cairo University and the resulting mounds of spoil, most structures are reduced to their stone foundations. There is no reliable information on the state of these structures before the 1920s, but their destruction most likely took place before the site came to the attention of archaeologists at the end of the nineteenth century. Karanis West currently measures about 300 by 400 m and is bounded to the north by the Cairo–Fayum highway, to the west by a secondary asphalt road going south past a storage facility of the Ministry of State for Antiquities (MSA, until 2011 the Supreme Council of Antiquities), to the south by the remains of the *sabakheen* light railway, and to the east by a dirt road which leads from the modern site entrance to the North Temple, by way of the new visitors' centre (Beyt Sobek) and the South Temple (fig. 6). The terrain consists of an even, gentle slope without significant vegetation, between the ancient town and the Fayum basin. On its south-western edge there are several dozen disk-shaped limestone boulders (1.5–2.5 m in diameter) eroded out of the limestone bedrock. Some were likely moved here when the area was prepared for construction. In one instance, a boulder was left in situ and incorporated into a wall. Recent intrusions include a track and several supports for power lines. One structure at the extreme

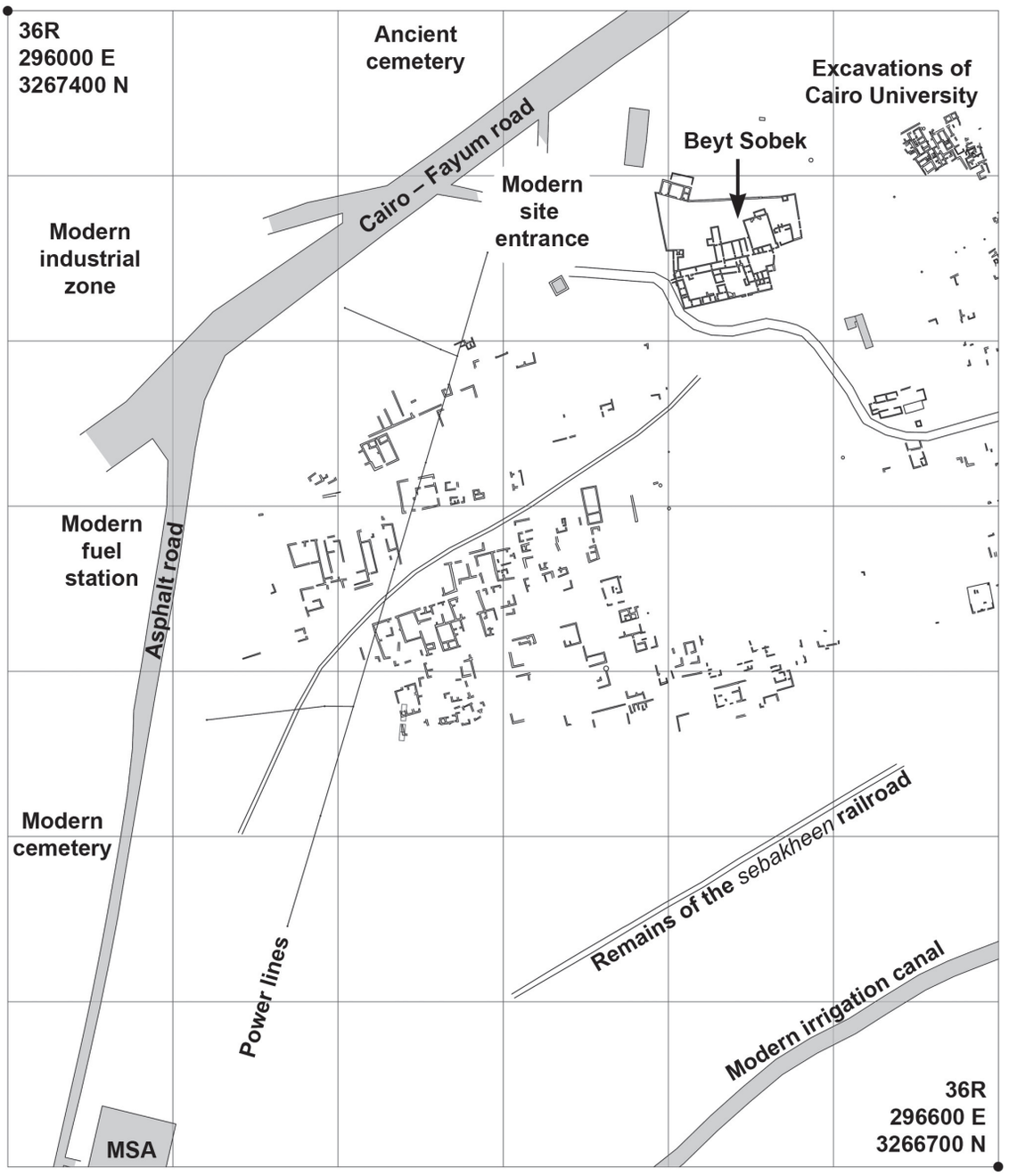

Fig. 6. Measured plan of Karanis West and its environs prepared in 2011 by Hans Barnard and Ben Nigra using a Topcon GTS-235W total station and a Trimble ProXRT differential GPS receiver. All coordinates are projected onto Zone 36R of the WGS84 geode. North is at the top of the map, each box is 100 by 100 m square. The large modern building marked MSA at the bottom left is a storage facility of the Ministry of State for Antiquities; 36R—296600 E—3266700 N at the bottom-right equals 29°N 30'48.1"—30°E 54'05.4".

northern edge of the site was recently cleared, most likely by representatives of the MSA. Two units (identified as KA06-05 and KA06-06, both 3 by 10 m) were excavated in 2006 at the south-western edge of the site to investigate the resolution of satellite imagery and our magnetometric survey.[17] These excavations established that here and

[17] Excavations were performed by Tessa Bryant, Melina Godard and Rebekah Merriman (University of Auckland) under the supervision of Willeke Wendrich; geophysical survey by Artur Buszek and Sebastian Pietrzak, under supervision of Tomasz Herbich (IAE PAN).

elsewhere in Karanis visible remains at the surface are indeed an accurate indication of the extent of the site. The two excavation units furthermore revealed two rather poorly built structures, one of which appeared to be a kiln and both likely with an industrial function. Based on the analysis of the abundant pottery sherds found in excavated contexts and on the surface, these buildings as well as most of Karanis West were inhabited in the fourth–sixth centuries AD.[18] This indicates that Karanis was active until a later date than previously inferred from the written sources. The large number of Christian burials exposed by the MSA in the ancient cemetery north of the Cairo-Fayum highway is concurrent with this assumption.

Karanis West comprised the remains of 517 walls, mostly preserved only at their foundation levels of irregular uncut stone, although some mud-brick architecture survived in the south-eastern part of the site (figs 7A, 8a and 8b). Rooms were generally rectilinear, some as small as 2 by 2 m. In several cases, buildings appeared as large multi-room compounds, the largest containing at least a dozen rooms. We also recorded single rooms, small structures with a few rooms, and single walls. In some cases, walls exceeded a length of 20 m. Scattered among the remains of these structures were several cut stone features not related to building construction. These included bases of olive presses (figure 7A: a, e; fig. 8d), millstones (fig. 7A: b, c, d, f, g), large stone mortars (figure 7A; i, j, k), and a decorated rectangular basin (fig. 7A: h). These features are not limited to Karanis West, but appear throughout the city.[19] It is unclear whether they did belong to individual households, to specific neighbourhoods, or to specialized industrial endeavours. Bases of olive presses are large, flat rectangular slabs roughly carved from local limestone with a central depression to receive the pulp to be pressed—most likely contained in a basket or cloth bag—and channels for draining the oil into a receptacle. At either end these bases have square holes for wooden beams that would have supported the pressing mechanism. Millstones are flat, circular slabs made of local limestone, about 0.8–1.2 m in diameter, showing wear in patterns indicative of grinding. At their centre each stone has a round or square socket or hole into which a wooden beam could be inserted. The most common arrangement seems to have been a horizontal stone on top of which one or two vertical stones rolled around like wheels, perpendicular to the horizontal stone. These installations were most likely used to crush olives before pressing to produce olive oil. Cereals would have been exported as grain kernels, while the production of flour for local use utilized so-called Olynthus or Theban hand-mills (a small hopper-rubber type mill).[20] The remains of many of these mills, invariably made out of pink Aswan granite, are scattered across the site. Large stone mortars with a maximum diameter of approximately 0.4 m are also present in significant numbers throughout Karanis. They are usually relatively well-made out of coarse local limestone and stand about 0.8 m high. Wear marks at the bottom of the

[18] N. Pollard, 'The Chronology and Economic Condition of Late Roman Karanis: An Archaeological Reassessment', *JARCE* 35 (1988), 147–62; S. Gupta-Agarwal, 'The Final Curtain Call: The Abandonment of Karanis in Light of Late Roman Amphorae', *Coptica* 10 (2010), 61–76; and S. Gupta-Agarwal, 'Cultural Transmission and the Influences of Consumer Demand: A Case Study Using Ceramics from Karanis, Egypt', in N. Poulou-Papadimitriou, E. Nodarou and V. Kikoglou (eds), *Late Roman Coarse Ware: Cooking Ware and Amphorae in the Mediterranean: Archaeology and Archaeometry: The Mediterranean: A Market without Frontiers* (BAR International Series 2616; Oxford, 2014), 125–32.

[19] Similar objects are discussed in Husselman, *Topography and Architecture*, for instance on pp. 12, 16, 54, 69.

[20] R. Frankel, 'The Olynthus Mill, Its Origin, and Diffusion: Typology and Distribution', *AJA* 107 (2003), 1–21.

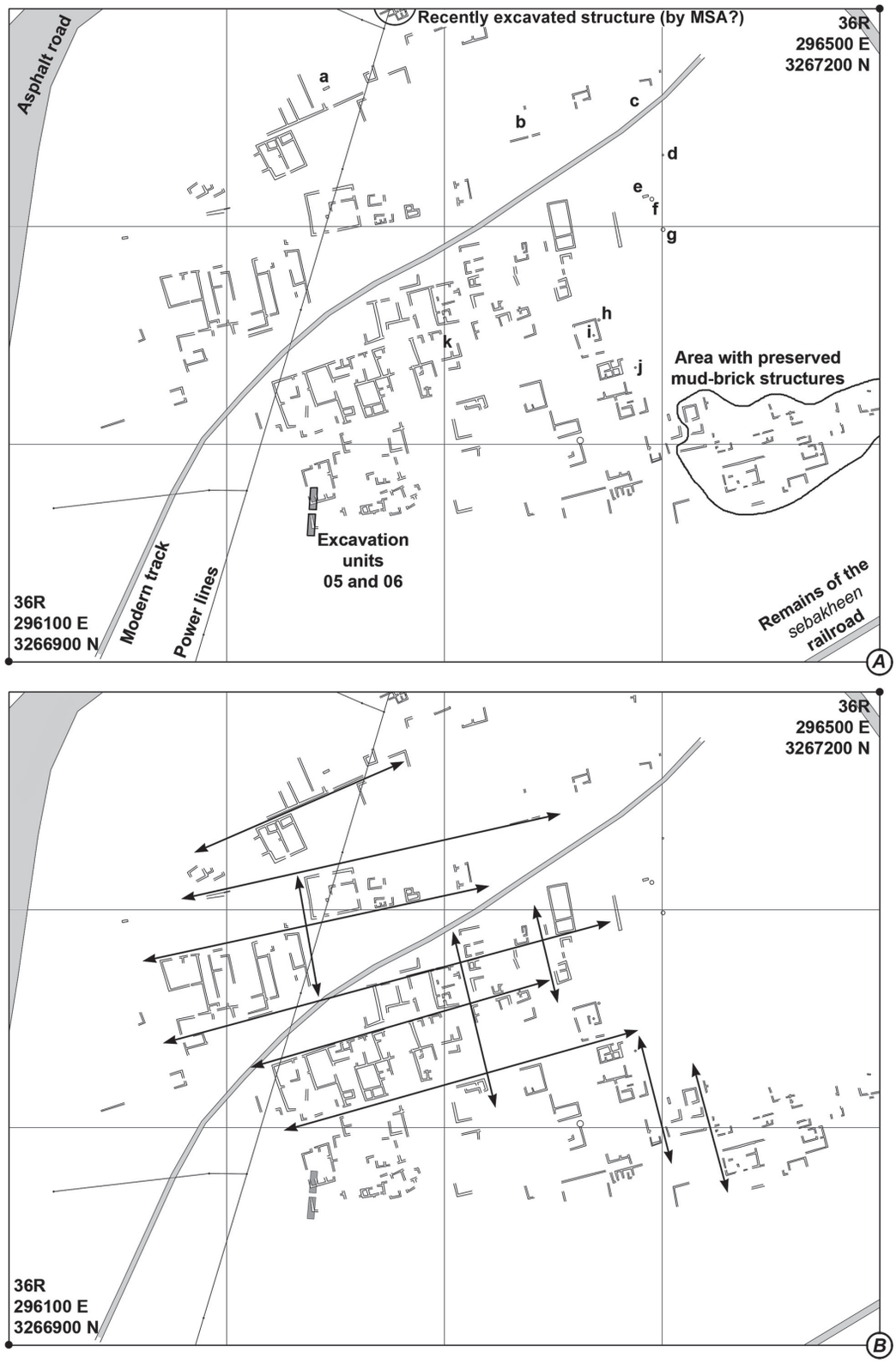

Fig. 7A. Detail of Karanis West, showing the visible remains of ancient structures. Letters mark large carved stone artefacts: a and e are bases of olive presses; b, c, d, f and g are millstones; h is a rectangular basin; and i, j, and k are large stone mortars; 36R—296100 E—3266900 N at the bottom-left equals 29°N 30'54.3"—30°E 53'46.7".

Fig. 7B. Detail of Karanis West, showing the visible street pattern.

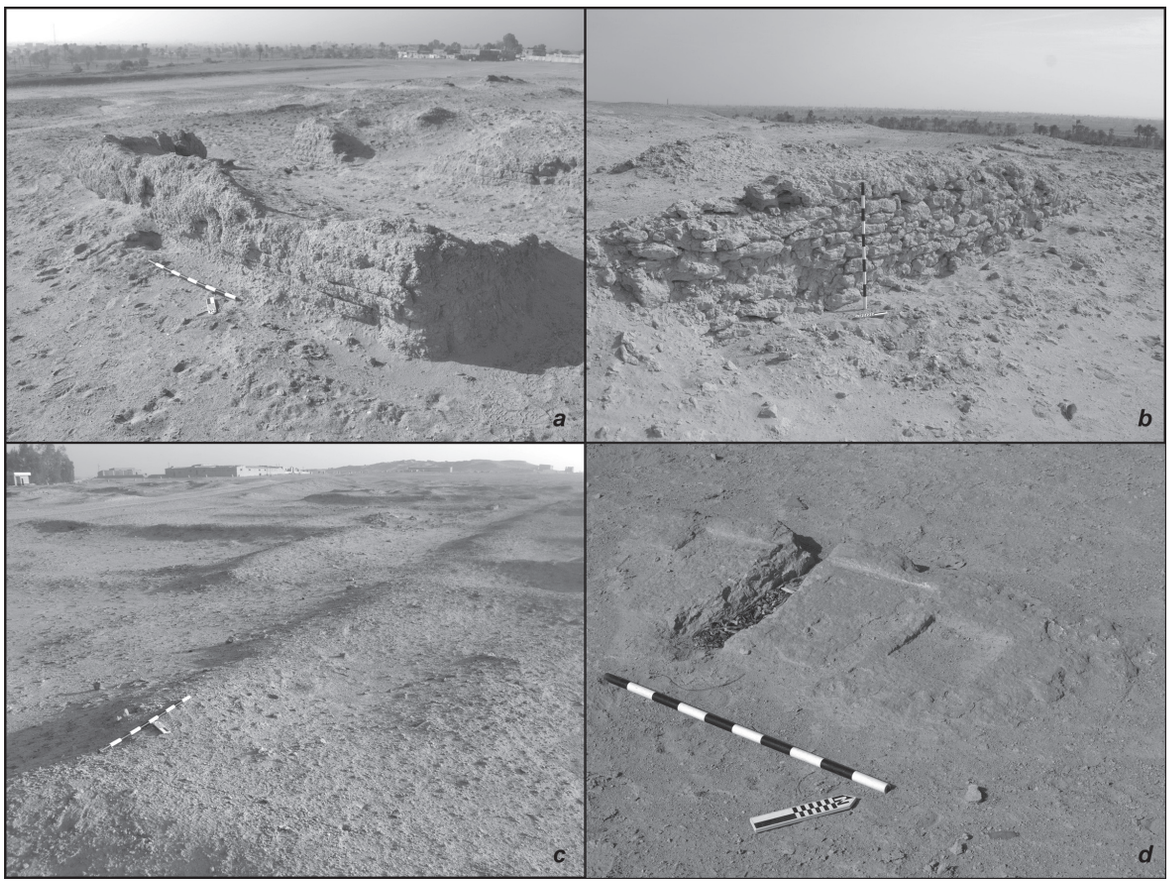

Fig. 8. a) preserved mud-brick wall in Karanis West, looking south-west; b) stone foundation in Karanis West, looking south-east; c) putative street in Karanis West, looking north-east; d) base of an olive press in Karanis West (Photographs by Ben Nigra.)

vessel attest to the use of pestles, probably made of wood, and the pounding of cereals or other food items, either for local consumption or for export. Although less common than the other stone artefacts mentioned above, there are at least a dozen olive presses in Karanis, two of which are visible on the surface of Karanis West. There are well-made out of local limestone, about 0.3 by 0.6 m and 0.3 m high. Most stand on four short legs and have two or four raised corners inside, while some are decorated on their outside. These served as washing (lustration) basins (similar to, for instance, Louvre AF 6267) and may have been associated with religious ceremonies or the homes of wealthy individuals or families.

The architecture of Karanis West, combined with the stone features described above, suggests that the area comprised the same mixture of living and working quarters as the city centre. Due to the deterioration of the buildings and the fact that their remains are partly buried by windblown sand, the street plan is difficult to infer from the map. In many places, however, shallow linear depressions in the sandy surface suggest the presence of former thoroughfares between almost completely decayed walls (fig. 8c). We plotted these remnants of ancient streets on the plan of the area (fig. 7B). The orthogonal layout implies that the occupation of the area was planned before its construction. Six more or less parallel streets run roughly east–west, intersected by shorter segments—either originally constructed as such or later interrupted by buildings—that run approximately north–south. This is interesting given the earlier

interpretation of the central part of town, discussed above, in which no east–west thoroughfares appear to have existed while at least two major north–south streets remain preserved. The orthogonal layout and orientation of these streets towards the main city suggests that Karanis West was built as an extension of the city after the initial occupation of the city centre, rather than an informal non-structured addition to the urban centre or a more or less independent settlement. In the case of Karanis West, the streets were possibly the extension of streets passing through the central part of town. The connecting parts, however, are now obscured by the thorough destruction of the city centre, combined with the large mounds of back-dirt deposited by the excavators.

Karanis East

In the area north-east of the buildings excavated by the University of Michigan and Cairo University and the resulting mounds of back-dirt and spoil, there is a large number of relatively well-preserved buildings constructed out of mud brick on stone foundations. As Karanis West is closest to the cultivated area and the light railway of the *sebakheen*, it would have been the first part of town to be recycled as fertilizer; Karanis East apparently escaped a similar fate leaving it available for investigation. Excavations are ongoing in this area, a detailed description of which will be published in the near future. The area currently measures about 300 by 400 m with a higher density of structures than Karanis West (fig. 9). The terrain is an almost even slope without significant vegetation, between the ancient town and the valley to the north, which at present contains the Cairo–Fayum highway. In ancient times, this sections as well as the central city likely extended further north, towards the ancient cemetery on the opposite slope.[21] Based on its layout and appearance, one large structure found north of the modern asphalt road was most likely not a tomb, but there is currently insufficient evidence to speculate on its former function. Some of the structures connecting the town with the cemetery must have been completely destroyed when the road was first constructed in 1927, or during subsequent building activities during its development into the current highway. Just before the southern edge of the suburb the slope on which it is built reaches its highest elevation, forming a ridge where the underlying bedrock comes to the surface. The buildings beyond this ridge are on the slope leading down into the Fayum basin. Further south the strip of flat circular limestone boulders eroding out of the limestone bedding, noted in Karanis West, continues. Some of these may have been moved here when the area to the north was prepared for construction. Others were quarried away, either to make room for the foundation of the houses or to be used in the foundation of the temples. As in Karanis West there are several instances where such a boulder was left in situ and incorporated into a wall. Recent intrusions include an unpaved road between the Cairo–Fayum highway and a modern olive grove, as well as many robber pits. The surface of a large but shallow midden at the north-eastern edge of the site shows mostly modern debris, but may preserve older material deeper below the surface.

Similar to Karanis West, two more or less parallel streets run roughly east–west, as do several shorter segments of streets. These east–west streets intersect with one long and several shorter segments of streets that run approximately north–south. It seems

[21] Petrie, *Illahun, Kahun, and Gurob*; Cook, *Landscapes of Irrigation*.

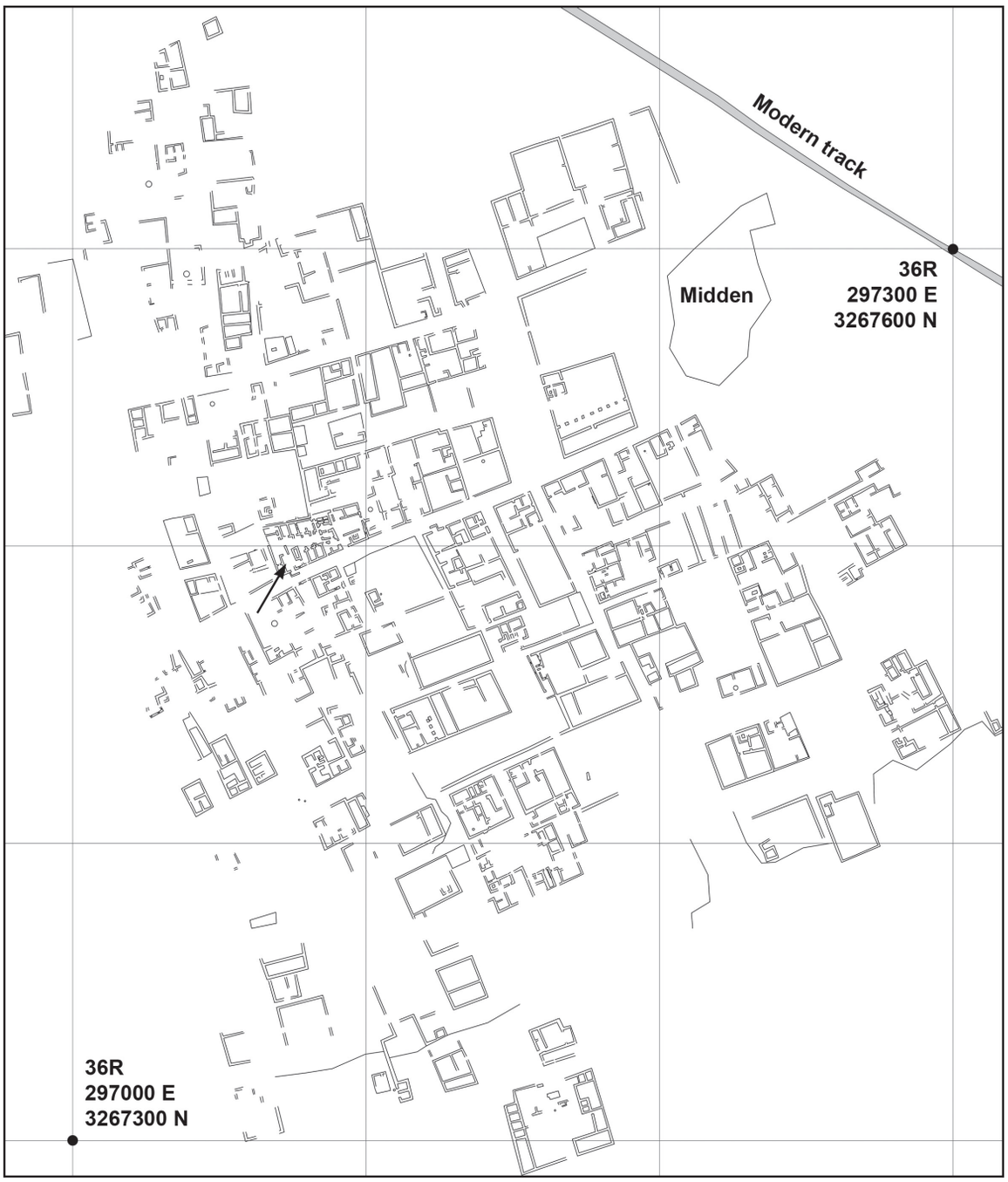

Fig. 9. Measured plan of Karanis East prepared in 2008 by Hans Barnard, Erwin Bolhuis and Sander Tiebackx (University of Groningen) using a Topcon GTS-235W total station. All coordinates are projected onto Zone 36R of the WGS84 geode. North is at the top of the map, each box is 100 by 100 m square. The arrow indicates the position and direction in which the photograph in figure 10 was taken; 36R—297000 E—3267300 N at the bottom left equals 29°N 31'07.8"—30°E 54'19.8".

obvious that Karanis East was planned before construction as an extension of the main town. In several places low walls were subsequently constructed into the streets, as noted earlier in the central part of the city,[22] probably to protect the entrance behind it from street level build-up of sand and trash, as well as intruders. Two buildings in this

[22] Husselman, *Topography and Architecture*, 29–31.

Fig. 10. The large storage facility (thesauros) in Karanis East at the end of the 2012 excavation season (photograph by Jason Quinlan). The photograph is taken looking north-east from the east–west street south of the structure (see fig. 9). In the foreground, behind a retaining wall constructed by the excavators, is the L-shaped wall built into the street in front of the original entrance into the building.

part of town were excavated over several seasons.[23] One is a large, multi-room storage facility (*thesauros*) for grain and other agricultural products, such a safflower (figs 9 and 10). The front part of the building most likely initially served a different function and was later modified and extended into the final structure. Access into the building could be carefully monitored through a winding entranceway and an L-shaped wall built into the street. In the floor of the central room or courtyard of the structure were eight small openings, several of them with their wooden hatches still intact, leading into vaulted storage bins. Finds included agricultural products (including wheat and safflower seeds) and the remains of baskets, sandals, mud seals, faience vessels, and a terracotta shrine. Based on large amounts of excavated pottery sherds, the building was used between the second and sixth centuries AD.[24] The other structure, across the street from the *thesauros*, was a house with three rectangular rooms separated by a narrow corridor. In a second building phase a staircase to the roof or a second story

[23] Excavations were performed between 2008 and 2012 by students, staff and faculty of a series of archaeological field schools, facilitated by the Institute for Field Research, under the supervision of Karina Bechmann-Olesen, Emily Cole, Frédéric Herbin, Daniel Jones, Meryl King, Krystal Lords, Rabee Eissa Mohamed, Maria Naesborg and Rune Olsen, directed by Willeke Wendrich.

[24] Gupta-Agarwal, *The Final Curtain Call*; Gupta-Agarwal, *Cultural Transmission and the Influences of Consumer Demand*.

was added, following the ground-plan typical for Karanis. The northern wall in the smallest of these rooms preserved plaster with the remains of at least two layers of painted geometrical designs, mostly panels and lines in red and green. The entrance into this building was not from the wide east–west street to the north, but rather from a narrow alley to the east. At some point after its construction the building was enlarged towards the south away from the thoroughfare, with the addition of several rooms or courtyards. Excavation in the street between the two buildings revealed that the removal of *sebakh* already took place in ancient times, probably for use on the fields, as it is today. Apart from the wall built into the street in front of the *thesauros* and a second wall further east, traffic was also hampered by a large limestone boulder. This did show evidence of efforts to remove it, but was ultimately left in place. Part of the rock was then chiselled away to accommodate the northern wall of the house.

Discussion

Our survey of the remains of Karanis as they appear at the beginning of the twenty-first century shows a dramatic decline of the ancient mud-brick buildings after they were excavated in the 1920s and 1970s. Because these structures consist of an unstable building material that requires almost constant maintenance when exposed to the elements, mud-brick architecture is best protected by remaining buried in windblown sand mixed with mud-brick debris. This is evident from the fact that the buried buildings in Karanis endured the 1200 years between being abandoned and being excavated, but barely survived the following 80 years after being exposed. Taking this lesson to heart, recent excavation units have been backfilled carefully and a beginning has been made to repair and rebury some of the more fragile and representative structures on site. Taking this approach with the entire city, however, would not be feasible and leaves little for visitors to enjoy. Out of necessity we have instead taken the pragmatic approach of documenting what is left and protecting what is possible. During our study of the site it became clear that the ancient town extended much further east and west than the area that was previously investigated in any detail. The city probably also extended further north to connect with its cemetery, now severed from the settlement by the modern highway. The original street pattern of the town may have been more regularly laid out than can be inferred from the surface remains as these represent the final stage of a city continuously altered by its inhabitants and gutted by *sebakheen* or covered by archaeologists after its abandonment.

One of many remaining issues is the difference in appearance and preservation between the central city and the two areas described in some detail above. Apart from their very different recent histories of destruction by *sebakheen*, stratigraphic excavation and the deposition of the resulting back-dirt, there seem to be more ancient differences between the area surrounding the two stone-built temples and the two suburbs. Although it is unclear how the different parts of the town were connected and whether there were ancient boundaries or discontinuities, the central city was evidently built up to a higher level. The remaining centre of town currently preserves a more complex architecture, with evidence of frequent remodelling of buildings that stand two or more stories high, when compared to its western and eastern neighbourhoods. The large amounts of refuse, sand and debris collected over time between and later also

within the buildings subsequently protected more of the earlier structures. In other instances, buildings appeared to have been filled with debris and used as foundation for a new layer of houses. The two extensions on the other hand appear to have much shorter and less complex habitation histories, although it remains difficult to assess how much of this is the result of differential preservation and destruction.

Karanis East existed longer than Karanis West, as is evident from in situ ceramics dated to the second century AD onwards, and may have been more closely connected to the central city. Both the *thesauros* and the house opposite show extensive remodelling. Karanis West was probably inhabited during a shorter period. The start date of Karanis West and the expansion of Karanis East in the fourth century AD seem to coincide with the abandonment of Qaret Rusas and al-Qarah al-Hamra, briefly described at the beginning of this article. The first is at present on a peninsula in Lake Qarun, at about –41 mASL, while al-Qarah al-Hamra is at the slightly higher elevation of –39 mASL. Excavations in al-Qarah al-Hamra show that site has been submerged and was damaged by extensive wave activity. In the Ptolemaic Period the lake must have been approximately –37 mASL, while in the Roman Period the lake level was more similar to that of today: –44 m ASL. Evidence for a fourth-century AD abandonment of both villages coincides with the expansion of Karanis. A reasonable suggestion is that some time in the fourth century AD Lake Qarun flooded both low-lying settlements, which forced the inhabitants to find refuge on higher ground. The nearest settlement would have been Karanis, which lies approximately at sea level, well above the level of Lake Qarun when it flooded Qaret Rusas and al-Qarah al-Hamra. In Karanis the new inhabitants could have been housed in two extensions of the town, one hastily built towards the west and the other an adaptation and expansion of the buildings east of the central town. The fourth-century AD refurbishing and enlargement of an existing building in Karanis East, itself dated to the late second or early third century AD, into a *thesauros* may well be part of the same series of events. It has been suggested that there was a dam breach of a large irrigation reservoir in the south-west of the Fayum depression some time in the late Roman Period.[25] On the one hand, such a dam breach would have led to the desiccation of the areas formerly irrigated from the reservoir, on the other hand it would have resulted in a rise of the lake level and the flooding of low-lying settlements around Lake Qarun. If this is the case then the substantial and rapid expansion of Karanis may well provide the temporal circumscription for these catastrophic events.

[25] C. Römer, 'Why Did the Villages in the Themistou Meris Die in the 4th Century AD?', in C. Arlt and A. Stadler (eds), *Das Fayyûm in Hellenismus und Kaiserzeit* (Wiesbaden, 2013), 169–79.